



7 November 2018

High Prevalence of Accidents on Route 90

October-November 2018

In the past two weeks, three fatal accidents occurred on various sections along Route 90, killing 17 people.

All three accidents on Route 90 were head-on collisions. In other words, one vehicle (at least) deviated from its lane and collided head-on with a vehicle travelling in the opposite direction.

Route 90 is Israel's longest highway, measuring 479 km and stretching between Metula in the north and Taba in the south. Historically, the highway was divided into 5 sections that were only joined together into one road in the late 1960s. The entire highway passes through areas that can be classified as rural.

The recent series of fatal accidents merits an investigation of the factors common to all three:

- The accidents occurred on interurban roads (not at intersections);
- They occurred on double carriageways with one lane in each direction;
- They occurred on roads with colored dividing lines (road signs 801, 803).

Frequency (2013-2018)

Serious accidents on interurban roads (not at intersections), on double carriageways with one lane in each direction and colored dividing lines, by accident type, aggregated for 2013-2018:

| | Fatal accidents | Serious accidents | Frequency of grave accidents (fatal + serious) |
|-------------------------|-----------------|-------------------|---------------------------------------------------|
| Head-on / front to side | 222 | 540 | 39.5% |
| Injury to pedestrian | 72 | 103 | 9.1% |
| Front to rear collision | 70 | 259 | 17.1% |
| Side to side collision | 26 | 123 | 7.7% |
| Self-inflicted accident | 91 | 371 | 24.0% |
| Other | 15 | 36 | 2.7% |
| Total | 496 | 1432 | 100.0% |



The chart shows that, indeed, head-on or front-to-side accidents are the most frequent types of accidents on roads of this kind in the past six years – accounting for about 40% of all grave traffic accidents.

Deaths and serious injuries on single carriageway interurban road sections (not at intersections) with one lane in each direction and a colored dividing line, by accident type, 2013-2018:

| | Number of deaths | Number of victims with serious injuries | Frequency of casualties (deaths + victims with serious injuries) |
|-------------------------|------------------|-----------------------------------------|------------------------------------------------------------------|
| Head-on / Front to side | 297 | 983 | 48.37% |
| Injury to pedestrian | 73 | 114 | 7.07% |
| Side to side collision | 39 | 141 | 6.80% |
| Self-inflicted accident | 96 | 439 | 20.22% |
| Other | 17 | 43 | 2.27% |
| Total | 600 | 2046 | 100.00% |

The chart shows that nearly half of the casualties in accidents on interurban roads with characteristics similar to those of the recent series were involved in head-on or front-to-side collisions.

Since 2013, **Route 90 interurban road sections (not intersections) with a colored dividing line** have witnessed 30 fatal accidents and 71 serious accidents, claiming the lives of 54 victims and seriously injuring 131. Out of these, head-on or front-to-side collisions were implicated in 17 fatal accidents and 31 serious accidents, totaling 40 deaths and 74 victims suffering serious injuries. In addition, accidents on Route 90 comprise 6% of the total number of fatal accidents in Israel, and 5% of serious traffic accidents on interurban road sections with a colored dividing line.

According to the IRTAD annual report, in 2016, accidents on rural roads were very frequent in all IRTAD countries, causing 40% of traffic deaths in Portugal and 76% of traffic deaths in New Zealand. According to the report, the high percentage of deaths is caused by high driving speed, insufficient division



between driving directions, and poor infrastructure.¹ In rural areas in the U.S., the number of deaths in traffic accidents per 100,000 residents was found to be 4 times that of urban areas.²

The NRSA Model

According to the NRSA model, three components make up the **system for shared responsibility for road safety** intended to reduce casualties in traffic accidents. These components are the vehicle, the infrastructure, and human behavior; there are interfaces and mutual influences between the three, with technology constituting an integral part of each. Below, the series of fatal accidents on Route 90 will be examined with reference to these components.

The Vehicle

The three fatal accidents on Route 90 each involved a head-on collision between two vehicles belonging to different categories in terms of size, weight, and height.

As a rule, the physical size of the vehicle contributes to its safety level; smaller vehicles are damaged more frequently, with a greater probability of fatalities. The existence of safety measures such as passive and active warning systems regarding lane deviation and distance control, airbags, stability control systems, etc., are a factor in accident prevention.

Behavior

Route 90 passes entirely through regions classified as rural areas (the Galilee, the Jordan Valley, the Arava). These areas are characterized as follows:

- Sparsely populated
- Geographically distant from urban centers
- The presence of law-enforcement authorities is less dominant in keeping the public order.

The low motivation to behave lawfully in these areas has its source in a rural safety culture:³

- An infrastructure that conveys a disregard for safety
- Lower physical presence (police) and conceptual presence (remoteness, periphery) of the law

¹ Road Safety Annual Report (2018) *International Transport Forum*, www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2018_2.pdf

² Ward, 2007

³ Ibid.



- A sense of space that fosters a psychological sensation of being "alone on the road"

Problematic behavior that can cause a vehicle to deviate from the lane can be common on long, monotonous roads, with the driving continuing for a long period of time. Such behavior may include: driving above the speed limit, hazardous driving that can include distraction, frequent overtaking, fatigued driving, and failure to wear a seatbelt.

Driving above the speed limit: in a 2017 speed survey, two sections of Route 90 with characteristics similar to those observed in the recent accidents were examined – a northern section and a southern section (each with one lane in each direction), where the speed limit was 80 km per hour:⁴

- In the northern section, the average actual speed was 86.8 km per hour.⁵ The speed at the 85th percentile was 98.2 kph – nearly 20 kph above the speed limit.
- In the southern section, the average speed was 97 kph,⁶ and the speed at the 85th percentile was 112 kph – over 30 kph above the speed limit.

According to Elvik's power model,⁷ the probability of fatality at an impact speed of 160 kph is close to 100%. This means that even if drivers obey the speed limit, any head-on collision has a very high probability of proving fatal.

"Distracted" behavior: in a study recently published in the U.S., over half of all traffic accidents involved cellular phone distraction in the moments preceding the accident,⁸ on all types of roads.

In terms of technology, active safety systems are now available that could have assisted drivers in preventing accidents. These include warning systems and systems for correcting lane deviation – a system that not only warns the driver when the vehicle deviates from the lane, but also actively reroutes the car back to its driving lane.

Findings show that drivers are less inclined to unlawfully overtake other cars when their own vehicle contains driving speed reminder systems.⁹

It should be noted that even if the vehicle contains safety systems, in some circumstances these systems cannot prevent an accident, for example in the case of a faulty mechanism in the vehicle.

⁴ In the north, from Hamovil Junction leading to Menachamia, to Tzemach Junction; in the south, from Ketura Junction to Arava Junction.

⁵ With 7547 vehicles per day (24 hours) traveling in one direction.

⁶ With 3355 vehicles per day (24 hours) traveling in one direction.

⁷ Elvik, 2009

⁸ Dingus, 2016

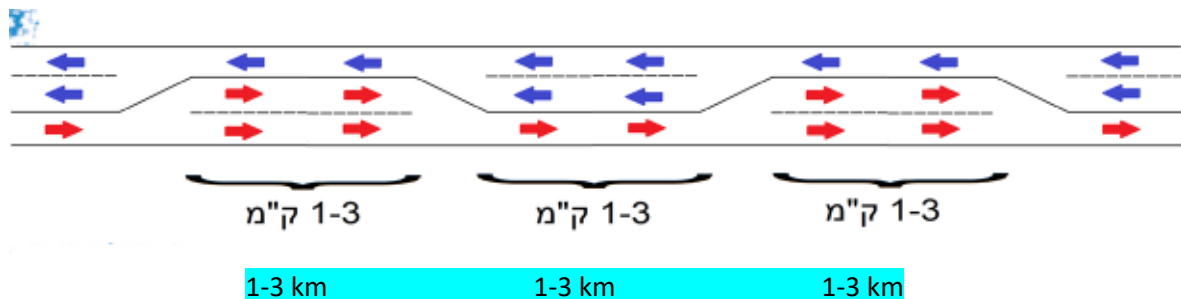
⁹ Jamsom et al., 2012

Infrastructure:

Rural roads are often characterized by:

- Poor infrastructure (narrow shoulders, few lanes in each direction, lack of a median separator)
- Challenging infrastructure (sharp turns, a long and boring road) which requires drivers to invest more effort in safe driving.¹⁰

In Israel, in addition to possible regulatory solutions (such as, for example, installing separators, creating dual carriageway roads with one lane in each direction, installing rumble strips), other solutions can be modeled on those adopted in various countries for single-carriageway two-directional roads, the most common being the "2+1 highway." Such highways first appeared in Sweden in the 1990s, but today are relatively common throughout Europe. They contain one lane in each direction and a central lane that changes direction every 1-3 km, allowing for safe overtaking. Head-on collisions are prevented by a cable barrier installed along the entire length of the road. In Sweden, highways upgraded to "2+1 roads" led to a reduction of 76% in the number of traffic deaths.¹¹ In Poland, serious accidents decreased by 43% on "2+1 highways."¹²



In conclusion –

A combination of several factors generates a proliferation of accidents in rural areas, usually leading to grave outcomes:

- A bi-directional interurban road, one lane in each direction, without a physical separator;

¹⁰ Ward, 2007

¹¹ Carlsson, 2009

¹² Cafiso et al., 2015



- Road characteristics – remoteness from urban centers, a long, boring road, a perceived low probability of law enforcement;
- Driving at high speeds;
- A rural safety culture characterized by unlawful driving (driving at high speeds, distraction, and more).

These issues should be addressed using means that integrate the components of human behavior, infrastructure, and the vehicle.



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